Claims

1. A method for the optical inspection of a transparent protective layer (14) and of a colored patterned surface (12), whereby the transparent protective layer (14) at least partially covers the colored patterned surface (12), said method using a first source of illumination (40) and an imaging sensor (42) associated with the first source of illumination,

characterized in that,

in order to recognize defective places (30) inside and beneath the transparent protective layer (14), the protective layer (14) is illuminated with light emitted by the source of illumination (40), whereby the first source of illumination (40) emits light in the shortwaved visible range and the light striking the surface penetrates at least partially into the protective layer (14) and is scattered at the defective places (30), in that light scattered back from the defective places (30) is picked up by the imaging sensor (42) and in that the defective places (30) are recognized by the local increase in the intensity of the light picked up by the imaging sensor (42) in the area of the defective places (30).

2. The method according to Claim 1, characterized in that the imaging sensor (42) associated with the first source of illumination (40) is essentially only sensitive to light emitted in the wavelength range of the first source of illumination (40).

3. The method according to one of Claims 1 to 2, characterized in that the first source of illumination (40) and the imaging sensor (42) associated with the first source of illumination (40) are arranged perpendicularly above the surface of the transparent protective layer (14).

4. The method according to one of Claims 1 to 3, characterized in that the defective places (30) in the transparent protective layer (14) are turbid places.

5. The method according to one of Claims 1 to 4, characterized in that the light emitted by the first source of illumination (40) is imaged in the form of a line on the surface of the transparent protective layer (14) and in that the widening of the line caused by the back-scattered light in the area of the defective places (30) is detected on the surface of the protective layer (14) by the imaging sensor (42).

6. The method according to one of Claims 1 to 5, characterized in that a second source of illumination (46) is provided that emits light at a first wavelength (λ_1) that excites the protective layer (14) to fluoresce with light at a second wavelength (λ_2) that is different from the first wavelength, in that the fluorescent light is picked up by an imaging sensor associated with the second source of illumination (46), and in that defective places (50) in the transparent protective layer (14) are recognized on the basis of local changes in the intensity of the fluorescent light.

7. The method according to Claim 6, characterized in that the imaging sensor associated with the second source of illumination (46) has a greater sensitivity in the wavelength range of the second wavelength (λ_2) than in the wavelength range of the first wavelength (λ_1).

8. The method according to one of Claims 6 or 7, characterized in that the light emitted by the second source of illumination (46) is imaged in the form of a line on the surface of the transparent protective layer (14) and in that the change in the intensity of the line on the surface of the transparent layer (14) caused by changes in the intensity of the fluorescent light is detected by the imaging sensor.

9. The method according to one of Claims 6 to 8, characterized in that the defective places (50) are areas on the colored patterned surface which are not covered by the transparent protective layer (14).

10. The method according to one of the preceding claims, characterized in that a single source of illumination (41) is employed as the first source of illumination (40) and as the second source of illumination (46).

11. The method according to one of the preceding claims, characterized in that color defects in the colored patterned surface (12) are detected by a color-capable imaging sensor (20).

12. The method according to one of the preceding claims, characterized in that, in order to detect defects on the surface of the transparent protective layer (14), a third source of illumination (24) emits a directed beam of light that is reflected off the surface of the protective layer (14), in that the reflected light is picked up by an imaging sensor (26) associated with the third source of illumination (24), and in that the defects on the surface of the transparent protective layer (14) are recognized on the basis of changes in the intensity of the light picked up by the imaging sensor (26).

13. The method according to one of the preceding claims, characterized in that various imaging sensors (20, 26, 42) with their associated sources of illumination (18, 32, 41) are shielded from each other.

14. The method according to Claim 13, characterized in that the various imaging sensors (20, 26, 42) with their associated sources of illumination (18, 32, 41) are shielded from each other in that they operate at different, non-overlapping wavelength ranges.

15. The method according to Claim 14, characterized in that the first source of illumination (41) and the third source of illumination (24) emit light in different, non-overlapping wavelength ranges and in that the imaging sensors (42, 26) associated with the first and third sources of illumination (41, 24) are sensitive in different, non-overlapping wavelength ranges.

16. The method according to one of the preceding claims, characterized in that the colored patterned surfaces (12) and the transparent protective layer (14) are parts of laminate floor covering elements, whereby these laminate floor covering elements (10) comprise wood or plastic substrate elements (10) onto which multi-colored printed films (11) with a colored patterned surface (12) are arranged and which are covered by a transparent protective layer (14).

17. The method according to one of the preceding claims, characterized in that the surface of the transparent protective layer (14) is provided with an embossed structure.

18. An arrangement for the optical inspection of a transparent protective layer (14) and of a colored patterned surface (12), whereby the transparent protective layer (14) at least partially covers the colored patterned surface (12), said arrangement comprising a first source of illumination (40) whose emission spectrum encompasses shortwaved visible light and an imaging sensor (42) associated with the first source of illumination (40) which picks up light scattered back from defective places (30) inside and beneath the transparent protective layer (14), and by means of which the defective places (30) can be recognized by the local increase in the intensity of the light picked up by the imaging sensor (42) in the area of the defective places (30).

19. The arrangement according to Claim 18, characterized in that a second source of illumination (46) is arranged at a distance from the transparent protective layer (14) to be inspected, whereby the second source of illumination (46) emits light at a first wavelength that excites the protective layer (14) to fluoresce with light at a second wavelength that is different from the first wavelength, and in that an imaging sensor associated with the second source of illumination (46) is provided that is arranged in such a way that it can pick up the fluorescent light of the protective layer (14), whereby defective places (30) in the transparent protective layer (14) can be recognized by local changes in the intensity of the fluorescent light.

20. The arrangement according to one of Claims 18 or 19, characterized in that a color-capable imaging sensor (20) is provided for detecting color defects in the colored patterned surface (12).

21. The arrangement according to one of Claims 18 to 20, characterized in that a third source of illumination (24) is arranged at a distance from the transparent protective layer (14) to be inspected, in that an imaging sensor (26) associ-

ated with the third source of illumination (46) is likewise arranged at a distance and at the same angle as the source of illumination (24) in terms of the protective layer (14) to be inspected, and whereby the imaging sensor (26), for purposes of detecting defects on the surface of the protective layer, can pick up the light that has been emitted by the third source of illumination (24) and that has been reflected off the surface of the protective layer (14).

22. The arrangement according to one of Claims 19 to 20, characterized in that various imaging sensors (20, 26, 42) with their associated sources of illumination (18, 32, 41) are optically shielded from each other.